



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/961,193	09/20/2001	Bulent M. Basol	042496 0269244	4599

27498 7590 11/18/2004  
PILLSBURY WINTHROP LLP  
2475 HANOVER STREET  
PALO ALTO, CA 94304-1114

EXAMINER
----------

WONG, EDNA

ART UNIT	PAPER NUMBER
----------	--------------

1753

DATE MAILED: 11/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/961,193

**Applicant(s)**

BASOL, BULENT M.

**Examiner**

Edna Wong

**Art Unit**

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 5-19, 21, 22 and 29-33 is/are rejected.
- 7) ☒ Claim(s) 3, 4, 20 and 23-28 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>October 27, 2004</u> . | 6) <input type="checkbox"/> Other: _____  |

This is in response to the Amendment dated October 22, 2004. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Response to Arguments***

#### **Double Patenting**

Claims **1-33** have been rejected under the judicially created doctrine of double patenting over claims 1-30 of U. S. Patent No. 6,534,116 B2 since the claims, if allowed, would improperly extend the "right to exclude" already granted in the patent.

The rejection of claims 1-33 under the judicially created doctrine of double patenting over claims 1-30 of U. S. Patent No. 6,534,116 B2 has been withdrawn in view of the Terminal Disclaimer.

### ***Response to Amendment***

#### ***Terminal Disclaimer***

The terminal disclaimer filed on October 22, 2004 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US Patent No. 6,534,116 has been reviewed and is accepted. The terminal disclaimer has been recorded.

***Claim Rejections - 35 USC § 112***

Claim **19** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 19

lines 1-2, it appears that the "copper or a copper alloy" is the same as the conductor recited in claim 1, line 14. However, it is unclear if it is.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims **1-2, 5, 7-8, 11-13, 16, 19, 21, 29 and 31-32** are rejected under 35 U.S.C. 102(e) as being anticipated by **Walton et al.** (US Patent No. 6,270,646 B1).

Walton teaches a method of plating a conductive top surface of a workpiece **1**, the conductive top surface of the workpiece including a top portion **1f** and a cavity portion **26** (Fig. 2A), the method comprising:

(a) applying, over the conductive top surface of the workpiece, an electrolyte

solution (= plating solution) with at least one additive (= plating additive) disposed therein, a first portion of the additive (= to suppress plating in other areas) becoming adsorbed on the top portion and a second portion of the additive becoming adsorbed on the cavity portion (= to enhance the plating rate in areas of the wafer where metal is desired) [col. 5, lines 19-21];

(b) using a workpiece-surface-influencing device **21** (= sponge) to make physical contact with the top portion and establishing relative movement with the workpiece (= the back surface **21b** of the sponge be able to move relative to the wafer while in contact therewith, without damaging the seed layer or plated layer) [col. 4, lines 24-29] to change at least the first portion of the additive adsorbed onto the top portion (= a plating additive designed to inhibit plating would tend to be transported more slowly in the thicker area **26** than in the thinner area **27**. This tendency could be further enhanced by doping the surface **21b** of the sponge with a chemical species which inhibits plating where the sponge and wafer are in more intimate contact, namely at the field regions of the wafer) [col. 5, lines 19-31];

(c) moving the workpiece-surface-influencing device away from the workpiece surface so that the physical contact between the workpiece-surface-influencing device and the workpiece no longer occurs (= the gap **25** between the sponge and the wafer (also filled with plating solution) is adjusted to permit relative motion between the wafer **1** and sponge **21**) [col. 3, lines 60-67]; and

(d) plating the conductive top surface of the workpiece with a conductor (= metals

or metal alloys) [col. 1, lines 6-8] obtained from the electrolyte solution at least during a period of time when at least some of the change is maintained and while the workpiece-surface-influencing device remains moved away from the workpiece surface (col. 4, lines 1-10; and Figs. 2 and 2A), thereby causing greater plating of the cavity portion relative to the top portion (col. 5, lines 19-21).

The conductive top surface of the workpiece is plated before and during the steps of using and moving (col. 3, line 58 to col. 4, line 10).

The at least one additive includes a plurality of additives, comprising both a suppressor and an accelerator (col. 5, lines 19-21).

During the step of plating, more effective accelerating additives exists on the cavity portion than on the top portion (col. 5, lines 19-31).

The step of using the workpiece-surface-influencing device creates the change by increasing suppressor species on the top portion (= a plating additive designed to inhibit plating would tend to be transported more slowly in the thicker area **26** than in the thinner area **27**. This tendency could be further enhanced by doping the surface **21b** of the sponge with a chemical species which inhibits plating where the sponge and wafer are in more intimate contact, namely at the field regions of the wafer) [col. 5, lines 19-31].

The step of plating continues without further contact being established between the workpiece-surface-influencing device and the workpiece surface to result in an overfill of the conductor being plated over the cavity portion relative to the top portion of

the workpiece surface (col. 5, lines 25-28; and Fig. 2).

The conductive top surface includes a plurality of cavity portions (col. 4, lines 7-10; and Fig. 2A), and the step of plating plates a conductive layer over the conductive top surface, such that the conductive layer is formed within each of the plurality of cavities, is formed over a flat top surface portion of the conductive top surface with a substantially planar thickness, and is formed over at least one of the plurality of cavity portions with a thickness that is greater than the substantially planar thickness to create an overfill thereover (col. 5, lines 19-31; and Fig. 2).

The one cavity portion is larger than a plurality of other cavity portions, and the plurality of other cavity portions have formed thereover the thickness of the conductive layer that is greater than the substantially planar thickness to create at least one another overfill thereover, and the one cavity portion has formed thereover the thickness of the conductive layer that is greater than the substantially planar thickness to create the overfill (col. 5, lines 19-31; and Fig. 2).

The step of plating includes the step of providing at least one of DC, AC and pulsed power during plating (col. 4, lines 40-44).

The step of plating plates one of copper or a copper alloy (col. 4, lines 28-29).

The step of using the workpiece-surface-influencing device causes a differential in a surface resistance between the top portion and the cavity portion (col. 5, lines 19-31).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims **6, 9-10, 14-15, 17-18, 22, 30 and 33** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Walton et al.** (US Patent No. 6,270,646 B1) as applied to claims 1-2, 5, 7-8, 11-13, 16, 19, 21, 29 and 31-32 above, and further in view of Applicant's admitted prior art (specification, page 2, lines 1-18).

Walton is as applied above and incorporated herein.

Walton does not teach wherein the plurality of additives includes Cl.

However, there are many types of Cu plating solution formulations, some of which are commercially available. One such formulation includes chloride ions (Applicant's admitted prior art, specification, page 2, lines 10-14).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the process of Walton with wherein the plurality of additives includes Cl because chloride ions are a



conventional additive in Cu plating solution formulations for proper action of the additives.

As to wherein the steps of using the workpiece-surface-influencing device, moving the workpiece-surface influencing device, and plating are repeated, the repetition of steps to provide the same results is well within the skill of one having ordinary skill in the art.

As to wherein the step of providing provides DC power and operates, at least part of the time in a current controlled mode in which a plating current is substantially controlled, it is well within the skill of the artisan to control the current during plating where the general conditions of the claim are disclosed in the prior art, it is not inventive to discover optimum working conditions by routine experimentation.

As to wherein the step of providing provides DC power and operates, at least part of the time in a voltage controlled mode in which a plating voltage is substantially controlled, it is well within the skill of the artisan to control the voltage during plating where the general conditions of the claim are disclosed in the prior art, it is not inventive to discover optimum working conditions by routine experimentation.

As to the step of adding another additive to the electrolyte that assists in

loosening a bond between the additive and the surface of the workpiece, Walton teaches that the plating additives may be used to enhance the plating rate of areas of the wafer where metal is desired, and to suppress plating in other areas (col. 5, lines 19-31). This teaching would have included adding additives to the electrolyte that would have assisted in loosening a bond between the additive and the surface of the workpiece because this is an additive that would have enhanced or suppressed the plating rate of the areas of the wafer where desired.

#### ***Allowable Subject Matter***

The following is a statement of reasons for the indication of allowable subject matter:

Claims **3 and 4** define over the prior art of record because the prior art does not teach or suggest the method according to claim 2 wherein the step of using the workpiece-surface-influencing device applies a mask that includes at least one opening therein through which a flow of electrolyte therethrough can be controlled.

Claim **20** defines over the prior art of record because the prior art does not teach or suggest the method according to claim 1 wherein power used for plating is not applied during the steps of using and moving.

Claims **23-28** define over the prior art of record because the prior art does not teach or suggest the method according to claim 1 wherein the step of using the workpiece-surface-influencing device uses a sweeper that has a sweeping portion that

physically contacts the workpiece with a surface area that is substantially less than the surface area of the workpiece surface.

The prior art does not contain any language that teaches or suggests the above. Therefore, a person skilled in the art would not have been motivated to adopt the above conditions, and a prima facie case of obviousness cannot be established.

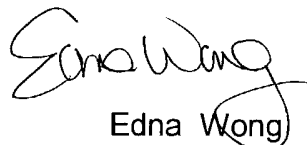
Claims 3-4, 20 and 23-28 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 3:30 pm, Flex Schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Edna Wong", with a stylized flourish at the end.

Edna Wong  
Primary Examiner  
Art Unit 1753

EW  
November 15, 2004